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British Chemical Standards

Report:

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FIRST ISSUE

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British Chemical Standards

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REPORT

ON THE

FIRST THREE YEARS' WORKING

OF THE MOVEMENT
AS AT PRESENT CONSTITUTED

September 1916 to September 1919

As given April, 1920.

With a few later notes up to the date of issue

A VOLUNTARY MOVEMENT FOR SCIENTIFIC ADVANCEMENT—
UNSUPPORTED BY ANY GRANT
and relying for its recognition solely on the value of its work.

Middlesbrough:
PUBLISHED BY THE ORGANISERS
3 WILSON STREET.

Telephone 873 Middlesbrough. Telegraphic Address "Laboratory," Middlesbrough.

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FIRST THREE YEARS' WORKING

SEPTEMBER, 1916, to SEPTEMBER, 1919

With a few later Notes up to the date of issue.

ALTHOUGH several years' work of a less public nature, during which the foundations of the present movement were laid, preceded this period, it is here proposed only to review what has taken place since it has been working on the fuller system of co-operation as at present constituted.

OBJECTS.

In order to follow how closely these have been and are being carried out, a condensed description from the circulars sent round to some 120 Chemists, when inviting extended co-operation, and which virtually form the **Articles of Association** of the movement, may be quoted.

EXTRACTS FROM THE ORIGINAL CIRCULARS.

Circular I.—September, 1916.

The "Function and use of Standard Analysed Samples" were described, and "Some of the uses of Standards" en-

*Compiled from the Minutes. This report, approved by the Committee, was presented by the Organisers in a somewhat fuller form and adopted at the General Meeting of Co-operators held at York on Friday, April 9th, 1920. See page 24.

umerated, and then a list of " Standard Samples it is proposed to prepare " (i.e., those required first) given, viz., as follows :—

Steels. † (a) Soft, medium, and hard carbon for C., Si., S., P., Mn., As.

† (b) Basic Open-Hearth for combined carbon only C. 0·1%, 0·2%, 0·3%, 0·4%, 0·5%, 0·65%, 0·85%.

† (c) Acid Open-Hearth, for combined carbon only, range as in (b).

† (d) Bessemer, for combined carbon only, range as in b).

† (e) Special alloy steels.

Irons. † (f) Grey Hematite iron, for total C., Graphite, Si., S., P., Mn., Ti.

‡ (g) Titaniferous Hematite iron, for total C. Graphite, Si., S., P., Mn., Ti.

(h) Phosphoric and foundry iron, analysis as in (f).

Iron Ores.

Manganese Ores.

Suggestions will be welcomed as to other samples for which there is likely to be a reasonable demand.

One Standard then ready was mentioned, and another which would be ready shortly. " Precautions to insure homogeneity," were then described, followed by the procedure for " the Analysis," in which is stated :—

" It is proposed to form a representative Committee (whose names will be published) of at least three public analysts and four works' chemists to very carefully analyse the samples and discuss and recommend methods of analysis. The results will be sent to one

†These or equivalent are already prepared.

‡In preparation, April, 1920.

headquarters where they will be compared, and any chemist not closely agreeing with the majority will be requested to repeat the analysis without knowing the other chemists' figures.

In this way a reliable independent standard should be obtained which could justly claim to be recognised by all metallurgical chemists in Great Britain as having a definite value.

Owing to the care and work necessary to produce really first class standards, progress may be rather slow; but a start has been made, and they will be issued by Messrs. Ridsdale & Co., 3 Wilson Street, Middlesbrough, as fast as possible.

The prices will be kept as low as possible in order to encourage the general and regular use of the standards in practice."

Promptly following this was :—

Circular II. Stating :—

" We wish to be guided by the most widespread requirements of Chemists in deciding the order in which to prepare further samples," and giving a list of 14 plain and alloy steels, cast irons, and ores, with blanks for other standards suggested, and a request for the recipients to mark and number their choice in order of their importance.

Circular III. December, 1916. Points about :—

" Standardised Analysed Samples and the formation of a British Chemical Standards' Association of Practical Workers," reviewed the position and discussed the " Essentials to a Chemical Standard for it to have the fullest value," showing the necessity for co-operative preparation, and that—

" **Every fresh supporter by the act of adopting a Standard endows it with increased value,** and the more widely it is accepted so its value grows in cumulative proportion. That is why **mutual co-operation** is essential, and the wider the basis of the Association the more valuable the result."

" **Who should prepare such Standards,**" was then discussed, and it was shown why this work should not at that time be relegated to some Scientific Society or left for Government to help to support it, the principal points being :—

" (a) Any single Institution exists primarily to forward its own specific interests ; and its outlook being therefore only from one point of view, is too narrow."

" (b) Any such bodies usually work extremely slowly, with meetings at long intervals."

" (c) The members of such committees as they would appoint would almost certainly not be elected for their peculiar fitness for this purpose, but be men whose age and general status has made them prominent, and who incidentally would not be themselves active workers with standards, and hence their perceptions of what is required would not be so keen as is desirable."

" (d) All these Bodies have had plenty of time and chance to take the matter up in the past, but they have not done so. Now, with their hands full of fresh schemes, they are less than ever likely to do so, and carry it through energetically."

" (f) Although, therefore, it is widely felt that there is **immediate need** that the want should be supplied, there seems no prospect of satisfactorily supplying it through any of the above channels, and a further obstacle to the formation of a fresh special body on

the ordinary lines, is that everyone is tired of paying membership subscriptions, and Companies of making donations."

"Such odd lots of standards as can be purchased through ordinary channels (such as chemical dealers) have no authoritative value and are necessarily excessively dear" (without some tangible result).

"We are driven back, therefore, to **private enterprise**—at any rate in the initial stages—and this presents advantages in the matter of elasticity, and provided the lines on which it is run are **clearly defined** and **widely approved** by **competent men,** the liberty of action so afforded permits of much quicker results."

"It is very important, however, that—whoever actually prepare and distribute the standards—the **vital** advice and support in the matter of obtaining, testing, etc., should be in the hands of **progressive minded men of repute**—representing the various classes of users who are **actively interested,** such as :—

	Representing
Works' Chemists	**Makers of Manufactured Material.**
Railway & Engineering Firms' Chemists.	**Users of ditto.**
Ore, Fuel, &c., Dealers.	**Owners and users of raw Material.**
Public Analysts.	**Reference Chemists** (independent)
Consulting Engineers.	**Specifications** drawn up.

These are the men who **know** what they **want,** and can **facilitate the getting and adoption of the standards."**

"Provided a selection of such men are willing to authoritatively represent these classes, to give their guidance and moral support, and act in the supervisory capacities named, as regards the preparation and distribution, and some suitably qualified private person or firm will undertake these latter, there should be no doubt as to the success of the movement."

"The chief deterrent to this is, of course, the considerable trouble and costs involved."

"Therefore a slight charge must be made to the general public to enable the matter to pay its way."

"Although it is by no means certain it will do so, especially in the initial stages, unless some one takes the risk, it" (the necessary work) "will remain at a standstill."

The Constitution of the Association is then described, consisting of :—

1. "**Acting Committee.**" (Later termed **Co-operators).** "*Representative of the various classes interested.*" Here reference is made to "if later, various Societies become interested."

2. "**Registered Supporters** (names enrolled). Who give moral support and some measure of help."

3. "**Users.** All groups, plus those who do not take any official part, e.g., the General Public — Buyers.

4. "**Originators and Acting Managers.**"

From these extracts stand out the following facts :—

1. That no **decreed** or asserted authoritativeness was sought for these Standards, but that this should be **inherent** and derived from their real value as acknowledged by their use and adoption.

2. That from their very inception they were in **no sense private** standards, but were prepared in accordance with opinions taken as widely as was practicable, and

their composition determined by a number of chemists representative of various sections of the industry, and districts.

3. That from the outset it was intended that they should cover a large field, steel and iron being only the commencement, but ores and other bodies were to follow.

4. That the only reason for commencing by private initiative was the absence of any action by societies or other official bodies, and the urgent necessity for obtaining immediate results, and that unless someone took a risk matters would remain at a standstill; but from the first, the interesting of societies, as such, was contemplated.

5. That the whole purpose of the movement was for Scientific Advancement, and forwarding the cause of Standards and the Unification of Analyses, not for profit or for other commercial advantage to those concerned, or for the forwarding of the interests of any particular Institution, &c., and it was intended to educate public opinion and to encourage the general use of Standards by making them as cheap as could be, provided they paid their way and so were not delayed by waiting for support from outside sources; and further, that apart from refusing to delay progress by subjecting procedure to the retarding influence of officialdom, everything was done to obtain the widest possible guidance as to what should be done throughout the whole matter.

CARRYING OUT THE OBJECTS.

These objects soon met with a hearty response, and nothing in connection with the matter has been more noteworthy than the willingness with which the co-operators went to very great trouble, and often expense, with no financial benefit to them-

selves, but only that due to the experience gained by thrashing out methods and building up their own knowledge of them—using the organisers as a clearing house together with the acquisition of a standard, which they had helped to prepare, and the satisfaction of knowing that they had carried out work much needed for scientific advancement.

CONSTITUTION.

A special feature of this is its mutually co-operative, and what may be termed "democratic" nature. The whole essence of the idea is union of purpose and mutual agreement as to what the composition of each standard is, **between the very sections of the industry amongst whom disputes as to analysis arise.** The element of self-determination is accordingly felt to be there, and these standards **win** their authority automatically, instead of it being imposed.

CO-OPERATORS.

A list, which is revised from time to time, of those who have assisted by work or material, is given on the successive certificates and price lists. The following is a copy of the latest at date of issue of this report :—

REFEREE ANALYSTS—INDEPENDENT.

Chesneau, Monsieur G., Professeur du Bureau d' Essais a l'Ecole Nationale Supérieure des Mines	Paris
Gray, G. Watson, (per G. Watson Gray, *F.I.C., F.C.S.* and Jas. Smith, *F.I.C., F.C.S.*) ...	Liverpool
Herdsman, W. H., Bath Street	Glasgow
Pattinson, J. & H. S. (Per J. T. Dunn, *D.Sc., F.I.C.*) Dean Street	Newcastle-on-Tyne
Pattinson & Stead, Queen's Square	Middlesbrough
*Ridsdale & Co. (Per C. H. Ridsdale, *F.I.C., F.C.S.*, and N. D. Ridsdale, *F.C.S.*), Wilson Street	Middlesbrough
Riley (Edward) & Harbord (Per C. O. Bannister *F.I.C., A.R.S.M.*), Victoria Street... ...	London
Thompson, Geo. Rudd, *F.I.C., F.C.S.*, ...	Newport (Mon.)

* Organisers.

RAILWAY CHEMISTS—Representing USERS issuing SPECIFICATIONS.

ROWLEY, E. W., North Eastern Railway ... ... Darlington
SMITH, H., Lancashire & Yorkshire Railway ... Horwich

GOVERNMENT DEPARTMENTS.

H.M. Naval Ordance Inspection Laboratory (Per Mr. F. G. Barker, Chief Analyst, succeeding J. C. W. Humfrey, *B.A., M.Sc., M. Inst.*) Sheffield
Ministry of Munitions Laboratory, (Per Mr. G. H. Hodgson, Chief Analyst), Townhead Street Sheffield
Research Department, Royal Arsenal ... ... Woolwich
TRASCIATTI, DR. DECIO, **Laboratorio Chimico Della R. Marina, Direzione di Artiglierie, E. M. Munizionamento, S. Bartolomeo** ... ... Spezia
VILLAVECCHIA, PROF. VITTORIO, **Laboratorio Chimico Centrale Della Dogane e Delle Imposte Indirette** ... ... Rome
United States Bureau of Standards (Per (*a*) L. F. Wittner and (*b*) J. I. Hoffman) ... ... Washington, U.S.A.

WORKS CHEMISTS—Representing MAKERS.

DAW, F. W., *F.I.C., A.R.C.S.*, Ebbw Vale Steel, Iron & Coal Co., Ld. ... ... Ebbw Vale
DEBY, B., Late of Cammell, Laird & Co., Ld. ... Sheffield
DUFTY, L., *B.Met.*, } Jonas & Colver Ld. ... ... Sheffield
DYSON, G. W. }
ELLIOT, T. G., *F.I.C.*, Hadfields, Ld. ... ... Sheffield
GRAHAM, C. S., *F.C.S.*, J. Lysaght & Co., Ld. ... Scunthorpe
HANSON, WELDON, *F.C.S.*, Clarence Steel Works Middlesbrough
HENSHAW, P. B., Kayser, Ellison & Co., Ld. ... Sheffield
HOWSON, RICHARD, Samuel Fox & Co., Ld. ... Stocksbridge
JOHNSON, C. M., Crucible Steel Company of America ... ... Pittsburg, Pa., U.S.A.
KELLEY, DR. G. L. Midvale Steel Co. ... Nicetown, Pa., U.S.A.
LANTSBERRY, F. C. A. H., *M. Sc., F.I.C.*, Birmingham Small Arms Co. ... ... Birmingham
MACWHIRTER, JAMES, *F.I.C.* William Beardmore & Co. Ld. ... ... Glasgow
SILLARS, D., Bolckow Vaughan & Co., Ltd ... South Bank
THOMPSON, J. L., Monk Bridge Iron & Steel Co., Ld. Leeds
WILKINSON, C., North Eastern Steel Co., Ld. ... Middlesbrough
WRAGG, J. H., *A.I.M.M.*, Samuel Osborn & Co., Ld. Sheffield
YOUNG, H. J., *F.I.C.*, North Eastern Marine Engineering Co., Ld. ... ... Wallsend-on-Tyne

MOTOR, AERO. LOCO. MAKERS—Representing USERS.

Clermont, J. D., Napier & Son, Ld.	London
Hall, H. C., *A.I.C., M.Met.*, Rolls-Royce, Ld. ...	Derby
Baldwin Locomotive Co. (Per J. A. Hance, Engineer of Tests)	Philadelphia, Pa., U.S.A.

FIRMS WHICH HAVE PROVIDED MATERIAL FOR STANDARDS—Messrs. :—

Dorman, Long & Co., Clarence Steel Works	(Two) ...	Middlesbrough
Fox, Samuel & Co.	(One) ...	Stocksbridge
Kayser Ellison & Co., Carlisle Works	(One) ...	Sheffield
Monk Bridge Iron & Steel Co. ...	(Three) ...	Leeds
Osborn & Co., Samuel, Clyde Street Works	(One) ...	Sheffield
Ridsdale & Co.	(Five) ...	Middlesbrough
Tees-Side Bridge & Engineering Co.	(One) ...	Middlesbrough

Assistance in securing Co-operators Abroad has also been received from Dr. Wm. Hillebrand, United States Bureau of Standards, Washington; Dr. (Chim.) Achille Longhi, Milan; and Monsieur F. Campredon, St. Nazaire.

The Co-operators had the misfortune to lose by death one of their early colleagues, Mr. C. J. P. Fuller, of the Lancashire and Yorkshire Railway, in 1918; but his successor, Mr. H. Smith, took up the work.

One or two others have through business changes, &c., been unable to continue the work personally, but it has been undertaken by their successors, and they still retain a keen personal interest in the progress of the movement.

STANDARDS PREPARED.

Four of the earlier ones "A.1," "B.3," "Q," and "S," issued between March and June, 1917, which were prepared in smaller quantity than later ones, have been exhausted, and since replaced, with the exception of "Q," a 0·67 % Carbon Standard which was left, as another body nearly two years ago (on July 26th, 1918) arranged to issue one of similar composition, and it being thought at that time that a harmonious working arrangement with them would be come to, there was a desire not to overlap. Unfortunately they have not yet issued the Standard in question

Besides the four Standards mentioned, nine others were issued between June, 1917, and October, 1919, serving for the range of plain carbon and some alloy steels, together with one hematite cast iron. Owing to the larger quantity of each standard prepared,† the greater number of Co-operators (which now include some abroad) testing each one, and other causes, it has been impossible to turn out the Standards as rapidly as needed; for it must not be forgotten that this is not like a lucrative commercial proposition to forward which unlimited extensions of plant and staff can be undertaken.

Nevertheless, there has been an average of one per three months.

The fourteenth Standard,* which will serve for high speed tool steels and numerous other recent types of alloy steel, contains approximately:—

Carbon	0·7%
Tungsten	16 %
Vanadium	0.8%
Silicon	0.2%
Chromium	3 %
Cobalt	5 %

besides the usual quantities of sulphur, phosphorus, manganese, &c., and as it will be tested by a larger number of Co-operators (including several abroad), than has been the case with any Standard hitherto, it should prove very useful.

Arrangements are also in progress for a special low phosphorus hematite iron Standard containing relatively high titanium, at an early date, while several Standards of other types are at various stages, and will be completed when time can be found to do so.

The following is a list of the Standards at present available; a large quantity of each has been prepared so that they may be relied on as procurable for a long time.

†See footnote, p. 22.

*Since issued, viz., in April, 1920. See list on next page.

Description	Special Features	ANALYSIS								
		Ni.	Cr.	V.	Combined C.	Si.	S.	P.	Mn.	As.
Basic Steel		%	%	%	%	%	%	%	%	%
" H "	C. S. & P. Standard only	—	—	—	0·428	0·15†	0·047	0·035	0·76†	—
" B4 "	Complete Analysis High P and As.	—	—	—	0·404	0·027	0·046	0·101	0·735	0·140
" I "	C and Mn Standard	—	—	—	0·521	—	—	—	0·726	—
Acid Steel										
" N "	Complete Analysis	—	—	—	0·170	0·117	0·034	0·037	0·432	0·029
" O "	C and Mn Standard	3·8†	—	—	0·325	—	—	—	0·590	—
" S1 "	C and P Standard only	—	—	—	0·921	0·07†	0·04†	0·051	0·60†	—
" T "	Ni Standard only	3·367	—	—	0·3†	—	—	—	—	—
Crucible Steel	Cr V Steel									
" V "	Complete Analysis	—	0·858	0·271	0·547	0·158	0·064	0·024	0·543	0·015†
Electric Steel	Co. W. Cr. Steel	Co.								W
" W "	Complete Analysis Advance Certificate	4·73* Nickel 0·44	3·03* Ti.	0·798* Total C	0·690*	0·190*	0·074*	0·027*	0·102*	16·20*
Cast Iron										
Hematite "A"	Complete Analysis	—	0·052	3·121	0·734	1·989	0·047	0·049	0·688	0·042
‡Cast Iron										
Hematite "B"	Low Phosphorus Titaniferous	—	0·3†	—	—	—	—	0·03†	—	—

†Approx. *Subject to revision in main edition. ‡In preparation.

PROPAGANDA WORK.

Quite apart from the **preparation and issue** of the Standards themselves, one thing absolutely necessary to progress towards the unification of analysis has been the arousing of interest in the subject, explaining the uses of Standards, and generally combating apathy, prejudice and ignorance, both in Chemists, Engineers, and others; and all this has involved a very large amount of work and cost. Of course, by very many, the advantages were fully realised, but it is surprising even now how many fail to see them clearly.

It should be recognised that the benefits of this work will not be confined to those associated with this movement, but will be shared also by any other Body which may issue Standards in the future, and it should be some satisfaction to feel that whatever may be the ultimate course of this Pioneer Movement, it is owing to its efforts that both official and unofficial circles have at last been effectively roused and practical steps taken which will facilitate co-ordination with the Chemists of other countries throughout the world.

Much of the most effective work in this direction has been by personal conversation of the Co-operators in the first place, whilst the example of a constantly growing body of users can hardly have been without considerable effect.

The **Technical Press** were not slow to recognise the value of the objects sought, and truly gave able assistance which, no doubt, has contributed materially to further the cause. The chief notices are:—the first article which appeared in the "Iron and Coal Trades Review," September 28th, 1917, a brief but succinct account of the movement, and a second in the same Journal on March 8th, 1918, giving a report of the meeting at York on February 22nd, 1918, also a later one June 13th, 1919, p. 802-3. Articles, &c., also appeared in "Engineering," April 5th, 1918, p. 374-5, "British Chemical Standards—Iron and Steel", "The Times Engineering Supple-

ment," March, 1919, p. 107, "Steel Analysis. Chemical Standardisation" ; "The Engineer," November 14th, 1919, p. 491. "Chemical Standards for Iron and Steel Analysis," also see their leader, p. 223, February 27th, 1920, and the letter, March 12th, 1920, third column, on "The Specification of Chemical Composition" ; "The Chemical News," June 13th, 1919, p. 288 "British Chemical Standards : Chrome Vanadium Steel V," also October 24th, 1919, "Analytical Standardisation," ; "The Chemical Trades Journal," September 27th, 1919, p. 339, "British Chemical Standards," and others.

A Paper, "Notes on Chemical Standards and their bearing on the Unification of Analysis," was read by the Organisers before the Society of Chemical Industry at Birmingham, on November 27th, 1918, and subsequently appeared in their Journal of February 15th, 1919.

An interesting article by Mr. H. W. Brearley, entitled "Chemical Standards in Relation to the Iron and Steel Trades," appeared in their Journal of March 31st, 1819, p. 97R., and was replied to by Mr. C. H. Ridsdale in one on June 16th, p. 220-201R., "The Bearing of Chemical Composition and its Accurate Determination on the Iron and Steel Trades."

THE ATTITUDE OF TECHNICAL SOCIETIES AND OTHER OFFICIAL BODIES.

Although the initiative was forced upon the Co-operators through the absence of action on the part of any Official Body to meet the urgent need for Standards, it was felt that the first consideration must be to carry out the objects undertaken in the broadest possible spirit ; and that this was a matter in which not one Society only but all the Societies concerned, should take a part, and each make recommendations from its own standpoint, and—as has been pointed out ; (fact 4, p. 7, from circulars)—" from the first the interesting of Societies as such was contemplated."

It was expected, too, that any Society, stimulated by this effort, which might take up the matter, would do so as a development of, or by arrangement with the existing movement. Accordingly, as one technical Body did decide early in 1917 to take steps for the issue of iron and steel standards of its own, with a view to avoiding unnecessary duplication, an offer was made to them by which they could amalgamate or work in concert with the present Movement ; but no arrangement has so far been come to.

OTHER SCIENTIFIC SOCIETIES.

In pursuance of the general objects, and the feeling expressed at the first York Meeting (February 22nd, 1918) and elsewhere, the Organisers over the last two years or so have brought the question of Standards before a number of Chemical and Technical Societies, commencing with the Institute of Chemistry in March, 1918. This Body formed a Standards Committee, of which Dr. Dunn was Chairman, which met on June 27th, 1918, and later convened a conference—which met June 26th, 1919—with that Committee, of representatives of the

Federal Council for Pure and Applied Chemistry,
Society of Public Analysts,
Chemical Society,
Society of Chemical Industry, and
Institute of Metals,

the attention of the Conference being directed mainly to the advisability of providing authoritative standard samples of **other** chemical substances than Iron, Steel, or Non-ferrous metals.

The President, on opening the Conference, related how the matter had been originally raised by one of the organisers of British Chemical Standards, and how their own Standards Committee had thereupon been appointed.

The whole matter was referred in the first place to the Society of Public Analysts and, will in due course be dealt with by them.

The question of engineers and buyers being recommended always to specify in terms of a definite chemical standard has also been brought before the Secretary of the **British Engineering Standards Association,** who explain that their Association is not a chemical body, and being partly dependent on Government and partly on a number of Institutions, they need, in order to warrant them taking such action, an expression of opinion from one or more official chemical bodies that Chemical Standards are useful, and that if they (the B.E.S.A.) would recommend their use, it would be helpful to scientific progress. Several Chemical Bodies have been informed of this, and have stated that the matter will be considered in due course.

The experiences gained during the development of the present movement have abundantly confirmed the correctness of the views held by Dr. W. F. Hillebrand (acting Director of the United States Bureau of Standards at Washington) and referred to in the Organisers' paper already mentioned, as to, *inter alia*, the slowness of committee work ; and, in the Organisers' opinion, entirely justify the action taken throughout this movement, independently of any societies, which was necessary to ensure rapid progress. At the same time, there has throughout been the endeavour to conduct it on a high plane, and on lines that would warrant the approval of the Societies of which Co-operators (although acting in their individual capacity) were members.

There has, therefore, always been a desire to welcome the interest, advice, and assistance of these Societies as such ; and now that some of them are taking action in connection with Standards, and have formed Committees which have included some of the British Chemical Standards Co-operators, it has been felt that it would be appropriate if those Bodies

in turn were also **officially** represented in the already established Pioneer Movement. Accordingly, with the approval of the Sub-Committee appointed by the Co-operators, a list of the latter has been submitted to the leading Chemical Societies and the British Engineering Standards Association, and they have recently each been invited to nominate two of their members—either from these or others whom they may choose—to represent them **officially** and act as Co-operators in the movement, with a view to the ultimate establishment of a Central Standard Body, or whatever may be considered the best course.

Matters which arise would then be referred to them as to the Co-operators at present; and they would equally receive invitations to General Meetings, and each could watch over the interests and advise generally from the point of view of their own Body.

So far some have felt that as the subject is under consideration of the Society of Public Analysts, they cannot usefully intervene. It has been explained to them, however, that no question of intervening arises, as the present Movement is simply carrying out its programme as arranged before any of these Societies became interested in the matter and representation in it—pending the maturing of their own deliberations—need not interfere with what they may ultimately decide to do as to Standards independently or in conjunction with other Bodies, but is bound to further the cause and promote harmonious working.

Before leaving the subject of Official Bodies, mention must not be omitted of the very ready and able, moral and Chemical assistance the present movement has received from three of our British Government Institutions.

The very great need by Chemists, in works making war material, of being able to compare their analytical testing with that of the Inspection departments, and attune their manufac-

ture to it or to that of other referees in order to avoid rejections and facilitate delivery, was (as has been mentioned in the Organisers' paper) brought before those departments first of all the Admiralty and later on the Ministry of Munitions (Land) Service and the Research Department of the Royal Arsenal, Woolwich, and in each case they not only agreed to co-operate with future standards, but also tested those already in use, their results being issued on supplementary certificates.

Dr. Wm. Hillebrand, who throughout has taken a very kindly interest in these efforts, not only arranged that the Bureau of Standards at Washington should co-operate in testing the recent alloy Steel Standards "V" and "W," but also that other well-known chemists in the United States, representing both makers and users, should co-operate.

To all of these the large body of users of Standards are much indebted, and there are many evidences of their appreciation.

MEETINGS.

As the objects had from the outset been clearly defined, and the co-operators, who were spread so widely, were kept in touch by correspondence, interviews, &c., with headquarters; and as the primary idea was to **get forward with the work** and **avoid the delay** which conventional formalities inevitably necessitate; and in view, too, of the cost and difficulty of travelling and hotel accommodation, meetings were only called when some specially important reason rendered it very desirable. In this connection anyone who has much to do with Council and Committee work is well aware that in most societies almost invariably the bulk of the effective work on any question is carried out by one or two of the members in informal conversations, the meeting only assenting to what had been **virtually decided before**.

Further, at meetings where weighty decisions are arrived at, the attendances are often small; or frequently the work

of a large Committee is delegated to a small Sub-Committee of three or four. In short, matters purporting to be governed by a large Committee are generally really controlled by one or two of the stronger spirits.

In this Movement it is believed that the proportion of control each co-operator exercises is at least as great as in any ordinary Committee work, and that the members taking part in decisions on vital matters of policy have been greater.

FIRST GENERAL MEETING.

The first General Meeting was held at York on February 22nd, 1918, Dr. Dunn in the chair, and the whole general policy was discussed, including the question of the proposed issue of Standards by another Body, the interesting of other scientific societies in Standards, finance, and the future programme.

Resolutions strengthening the Organisers' hands were passed for obtaining the co-operation of "additional Chemists from the principal works and other laboratories of the Country," and "rendering the Body of Co-operating Chemists still more widely representative and authoritative," unless or until amalgamation with some other Body should take place "on equitable terms"; and also authorising the Organisers to announce that the Standards were "issued under the auspices of the Body of Co-operating Chemists" who "approve of the prices charged for them."

SECOND GENERAL MEETING.

The second General Meeting was held at Birmingham on November 27th, 1918, Mr. E. W. Rowley in the chair, at which a general review was given, and it was decided to ask what the attitude of the Technical Body proposing to prepare Standards would be towards their own. This matter was subsequently, by a postal ballot vote, vested by the Co-operators in a Committee.

A Meeting of the Special Committee was held at Darlington on August 15th, 1919, in which besides general matters a further reply of the Technical Body proposing to issue Standards was considered, and further steps decided on.

FINANCE.

Although this has been reported on at each meeting, it is highly desirable that in this report the position should be made quite clear once and for all, so that no portion of the good which this Movement might do may be prevented, and no co-operation or approval, official or otherwise, be withheld through misunderstanding.

From the first it was recognised that only by a considerable sacrifice could the objects be attained speedily, and as there was no question of grant, or subscriptions, someone had to take the financial risk. This the Organisers undertook with the proviso that it was hoped later to make it pay its way, although there was no expectation, or intention, of making a profit from it as a commercial enterprise. Considerable expenses have been incurred for over 3½ years (for the expenses, of course, commenced long before the first Standard was issued), and it was felt by the Organisers, particularly after they had been urged at the first York meeting to undertake more work and push on with it harder, that in making up accounts of the position, the only correct point of view was to deal with it as in the case of any other Association keeping up an office and staff to forward its objects, and charge the costs necessitated in carrying on the matter, against the receipts. The Organisers are bound too, for their own knowledge, to keep a record of what it is costing them. In making up these accounts, they have charged nothing for their own staff in respect of analysis or time equivalent to that contributed by other Co-operators in standardising.

On this basis the accounts, which have from time to time been kindly audited by Dr. Dunn up to July 31st, 1919, and also submitted to one or two others, show to September 30th, 1919, that 1,826 portions of Standard had been issued equal to 172,590 grammes, of which 1,124 or 104,500 grammes = 60·5% had been sold, and 702 portions or 68,090 grammes = 39·5% had been consumed in standardising, paying (in kind) for Standards, &c. The receipts to the same date amounted to £802 4s. 6d. as against an expenditure in cash of £1,431 7s. 0½d., showing a deficit in cash of £629 2s. 6d.; this includes no allowance in respect of the Organisers' own time, the demand on and value of which has, of course, been very considerable.

In pursuance of the principle enunciated by the Organisers at the first York Meeting, all the material for Standards has been paid for by them, at the Provider's valuation, in **Standards** of their selection, which, of course, have an equivalent money value.

Prices Charged. With the original object of supplying Standards at as low a price as possible, and bearing in mind the approval at the York Meeting of the prices being charged, no increases have been made*, except to cover extra outlay on supplementary certificates issued, which, of course, add to the value of the Standards :—

May, 1918	1/- per bottle for Admiralty results	of 3 Standards
Sep., 1918	1/- per bottle for Ministry of Munitions results	of 6 Standards
Aug., 1919	2/- per bottle for Research Dept., Royal Arsenal, Woolwich, results	of 7 Standards

*Since the period covered by this report, owing to the very greatly increased cost of everything connected with the Gentian, and the low value of money, it has become necessary to make an increase from Feb. 6, 1920, of 25% on list prices.

Advertisements. - In order to let it be known what Standards are available, advertisements have, since the middle of 1919, been inserted in "The Chemical Society's Journal" (for which specially low terms were kindly granted) and "The Institute of Chemistry's Proceedings."

For an article such as this, however, advertisements in most technical publications are too expensive.

The position, summarised, to September 30th, 1919, is as follows :—

Cr.	£	Dr.	£
Realised	802	Spent	1,431*
Deficit	629		
	£1,431		£1,431

After making full allowance for the proportion of initial expenses it is still very doubtful if the remaining Standards can be sold without incurring considerably more cost than they will realise. Also it is, of course, uncertain that all will be sold, especially if any "Official" Body actually issues Standards in competition.

This expenditure is not regretted, as it has been for a good cause which it has proved very successful in furthering, for the widespread use of Standards has now got firm root, and there is no wish to shift this burden on to anyone else; but these figures have been shown to remove any misconceptions, and to prove conclusively that this work has not been carried out for the sake of profit, and therefore is entitled to **active moral support** from every Body existing for the further-

*One reason is, see Organiser's paper, p. 2, col. 2 "Weight Prepared" —the "vital necessity there should be enough of a standard when once standardised to last everyone using it for a long time, say several years . . . . . all prepared at once in its finished condition." Hence the outlay needed.

ance of science, and also to show that the Organisers cannot simply cease work in favour of, and transfer the whole thing to, some other authority, even though more suitable for the issue of Standards, unless, at the same time they are recouped fully for the value expended to the date of transfer.

At the same time, as the primary wish throughout has been simply to do the best to promote the cause of Standards, although the Organisers are confident that these Standards will hold their position whether or not any other Body also issues Standards, they are still willing to hand the whole matter over to a properly constituted Central Bureau in which all the Scientific Societies concerned are adequately represented, provided the requirements of recoupment, effective representation of the Co-operators of the Pioneer Movement, and the needs of users, are sufficiently guaranteed.

The success of this effort shows how it is possible for those determined on Scientific advancement to bring it about absolutely unaided by any outside grants or "Official" Body, though it is rather striking to contrast the need for this course here with the reception accorded in the U.S.A. to the movement started in a similar way, which soon received general favour, and substantial Government support.

The Organisers believe, however, that this arises from failure by these Bodies to realise the true circumstances, and they have confidence that when these are appreciated, the same cordial support will be forthcoming from those circles that has been given by so many works and laboratories both in this country and abroad.

Already these Standards are becoming recognised as not only British, but International, there being also Co-operators in the United States, Italy and France; and it is believed that they will, before long, do no small part in bringing about co-ordination of Chemists all over the world.

NOTE.—SUPPLEMENTARY TO THE REPORT.

The Fourth Meeting of British Co-operators of the British Chemical Standards Movement being the Third General Meeting—was held at York on Friday, April 9th, 1920, at the North Eastern Station Hotel. Mr. Herdsman in the Chair.

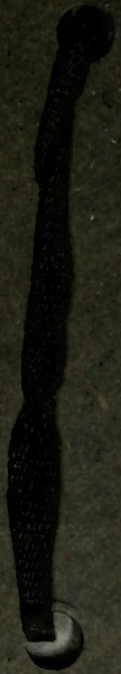
After the Minutes, the Chairman read the Report by Dr. Dunn (on behalf of the Committee) on the correspondence and negotiations with a Technical Body which proposed to issue Standards, and then called upon Mr. C. H. Ridsdale to read the foregoing Report.

The whole of the questions arising from these matters were then thoroughly discussed, and the following resolutions were drawn up and passed.

(1) "That the Co-operators recognise that their wishes (as "to the production and issue of Standards, &c.), as "expressed at the York Meeting in February, 1918, "have been satisfactorily carried out, and they ap- "prove of the selection of further Standards and "Co-operators, the action taken to interest Scientific "Societies in Standards, and the general conduct of "affairs by the Organisers, and adopt their report and "that of the Committee."

(2) "That the Co-operators of this Pioneer Movement, "having united to carry out a definite programme as "set forth in the Organisers' Circulars Nos. 1, 2 and "3 of 1916, and having given an opportunity on "equitable terms to another body which proposes to "issue Standards, to enter into harmonious working "arrangements with themselves, and an understand- "ing with that body not having so far been reached; "it is resolved that their own Association shall pro- "ceed with the programme originally set forth; and

" they request the organisers to continue to carry on
" the work on the same lines as hitherto, and will for
" their part continue to give the Organisers the utmost
" help in the carrying out of the objects embodied
" in that programme, until any scientific or other
" suitable Body or any Government Department
" prepared to make a grant, shall approach (or be
" approached by) them, and offer equitable terms
" with a view to uniting with and developing the
" present Pioneer Movement, and the formation
" of a representative Authority of National or
" International character, into which the Co-
" operators of their own Movement shall be absorbed
" or on which they shall be adequately represented."

(3) " That until their own or any such Body shall take over
" the financial responsibility on equitable terms, the
" Organisers shall be empowered to make such financial
" arrangements as will enable them to recoup them-
" selves for their outlay, and make the scheme self-
" supporting."

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